Total number of printed pages: **Programme(D)/6th Semester/DCE 602**

2023

Design of steel Structure

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	Write short notes on bolted and riveted connections. Discuss the advantages and disadvantages of bolted and riveted connection.	3+5=8
	b)	Explain the following terms with sketches: i) Pitch of bolts, ii) Gauge distance, iii) Edge distance iv) Staggered pitch.	6
	c)	Two plates of 16 mm are to be jointed using M20 bolts of grade 4.6 in i) Lap joint, ii) Butt joint using 10 mm cover plates. Determine the bolt value.	6
2.	a)	How do you determine efficiency of a joint in a bolted connection? Two plates 12 mm and 14 mm thick are to be jointed by a double cover butt joint. Assuming Fe 410 plate and grade 4.6 bolt, design the joint to transmit a factored load of 300 kN.	2+8=10
	b)	Design a bolted connection for a bracket carrying an eccentric load of 250 kN at a distance of 250 mm from the centre of the extreme bolts of an ISHB 350 @ O.674 kN/m. The thickness of the plate is 12 mm. Assume grade 4.6 bolt and Fe 410 steel. Take pitch = 60 mm and edge distance = 40 mm. Assume any missing data.	10
3.	a)	What are the advantages and disadvantages of welded connections? An ISMC 350 is used to transmit a factored force of 850 kN. The channel section is connected to a gusset plate of 12 mm thick. Design the fillet weld if the overlap is limited to 300 mm. Use slot welds if required.	4+6 = 10
	b)	Define and neatly sketch the following welded connections: i) Groove weld ii) Fillet weld, iii) Slot weld, iv) Plug weld. Design a suitable longitudinal fillet weld weld to connect 120 X 8 mm plate to 150 X 10 mm plate to transmit a pull equal to the full strength of the small plate. Assume welding is to be done in the field.	5+5=10
4.	a)	Write short notes with sketches on i) gross section area, ii) net section area for plates and angles, iii) design stress due to rupture of critical section for both plates and angles iv) block shear failure	3 X 4 =12
	b)	In a roof truss a tie member ISA 13013010 carries a pull of 250 kN and is connected with a gusset plate of 8 mm thick. Design the welded joint using both side and end fillet welds. Assume suitable value for missing datas.	8
5.		The single angle ISA 1007510 is used as a tension member. It is connected	20

		to a 12 mm gusset plate and arrange with 5 numbers of 20 mm diameter bolts at a pitch of 60 mm and end distance of 30mm. Calculate the strength of the angle when it is connected by i) the long leg, g = 60 mm, ii) the short leg, g = 40 mm.	
6.	a)	Calculate the load carrying capacity of a ISA 1007510 angle assuming that the angle is loaded through only one leg when i) it is connected by two bolts at the ends. ii) it is connected by one bolt at each end. iii) it is welded at each end	10
	b)	Write notes on buckling class of cross section. Determine the design axial load of a column section ISHB 300. The column is having a height of 6 m and is effectively restrained at mid-height by a bracing member in the z-z direction, but is free to move in the y-y direction and both the ends of the column are pinned. Assume Fe 410 grade steel and E = 2 X 10^5 MPa.	3+7 = 10